

16-MDCT : 심장 질환의 새로운 진단법

16 - MDCT : A New Modality for Diagnosis of Cardiac Diseases

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Abstract

Since the advent of 16 - MDCT in the clinical diagnosis, a paradigm shift is required in the diagnostic algorithm of cardiovascular diseases owing to its revolutionary technical advances. 16 - MDCT provides less than 1 mm of high spatial resolution even in z - direction by using detectors with less than 0.75 mm collimation, which in turn allows for volumetric scanning with isotropic 3 - dimensional resolution. This high spatial resolution of 16 - MDCT enables one to obtain high quality images of the small vessels such as coronary arteries with diameter < 1 mm. For imaging of the heart, scanning with a high temporal resolution is particularly important because of the strong movement during the cardiac cycle. 16 - MDCT allows images with a high temporal resolution, less than 250 msec, enough to freeze the cardiac motion. Furthermore, by using ECG information that is recorded simultaneously with the image acquisition, images synchronized to the specific cardiac phase can either be scanned or post - processed according to the technique of ECG - gating. In order to eliminate the motion artifact from respiratory motion, scanning must be completed within a single breathholding time. By adopting 12~16 detector arrays and less than 0.5 sec of gantry rotation time, imaging of the whole heart with sub-millimeter spatial resolution can be covered within 20 seconds of breathholding time. Major clinical applications of 16 - MDCT in cardiac diseases include detection of coronary stenosis and atherosclerotic plaque, coronary calcium scoring, evaluation of the patients after coronary angioplasty or coronary arterial by - pass graft, assessment of the cardiac valve morphology and function, and ventricular function and perfusion. Among these, currently the most practical area of 16 - MDCT application is post - CABG evaluation and the most important and promising area will be assessment of native coronary arteries for detection of stenotic vessels and for detecting and differentiating atherosclerotic lesions over a spectrum of vulnerable, soft, fibrotic, and calcified plaques. In this review, important technical aspects together with clinical applications of 16 - MDCT in diagnosis of cardiovascular diseases will be presented.

Keywords : Imaging · Computed tomography (CT);
Multi - detector row Heart · Coronary vessels

2002 16 de-
tector 16 - row Mul-
ti - Detector Computed Tomo-
graphy(16 - MDCT)가
2003

16 - MDCT

16 - MDCT가 , 가
. 16 - MDCT

CT

16 - MDCT

stent

가,
가,

가
가
16 - MDCT
210 msec
16 - MDCT
, MRI
가
210 msec
가
(algorithm)
(paradigm)
(segmentation)
(2, 3)
16 - MDCT
CT
(105 msec 가
(cardiac phase)
가 가
, CT)
20 가
가
16 - MDCT
2)
(Spatial Resolution)
가

Technical Aspect

1. 16 - MDCT

- 1) (Temporal Resolution)
(Left anterior descending artery)
(left circumflex artery : LCX)
가
가
1 mm
1 mm 가
(acquisition window)
가 70/min 250 msec
, 가 100/min
150 msec (1). 가
50 msec , MDCT
- 3) (Contrast - to - Noise Ratio)
(atherosclerotic plaque)
(attenuation)
가

4 ml/min 100 ml

2. (Cardiac Phase - Consistent Synchronization)

16 - MDCT

4) (Image Acquisition Time)

(scanning)

(reconstruction)

(retrospective gating)

가

20

16 - MDCT

(detector)

0.5

가 0.75 mm

table - feed

가

R (relative delay)

R

R - R %

0.75 mm 12

0.42 , 1 table -

(absolute delay)

feed 2.8 mm , 20

R

1 mm (transverse axial)

(reconstruction)

absolute reverse).

absolute

200 ~ 250

reverse ,

가 ,

absolute delay ,

(maximum intensity projection : MIP),

가

(3 - dimensional volume rendering : 3 - D

relative delay absolute reverse

VR) - (post - processing)

, 가

가 가

(4, 5).



1. 16

Clinical Application

1.

1)

16 - MDCT 1 mm

가 (mid - end - diastole)

1 mm

3. (Cine Imaging)

16 - MDCT

(1). 1 mm

(2) (3)

MIP, 3 - D VR -

R

가 Ropers D (6) MDCT 가

16 - MDCT

77 57

가가 가

(74%), (left main coronary artery),

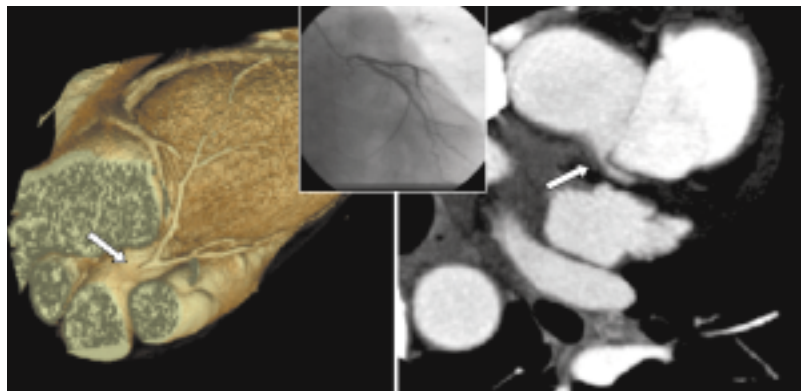
table - feed

가 table - feed

(overlap)

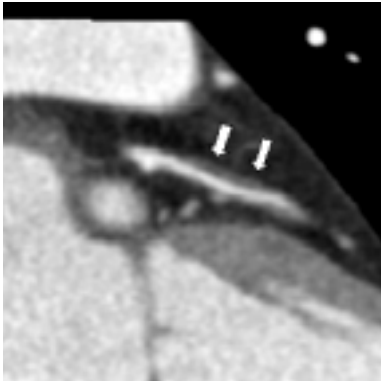
(gap)가

table - feed

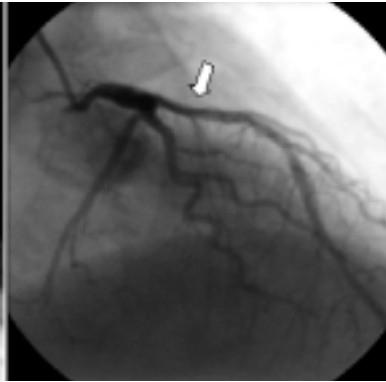


2. 43

16



3.



16

가

가

2)

가

(Coronary Artery

By - pass Graft : CABG)

LAD, LCX, (right coronary artery) 4

308

가

16 -

270

가가 가

(88%).

MDCT CABG, (coronary angio-
plasty)

85%

가가 가

(coronary angiography)

92%,

(negative predictive

가

value) 97%

(4).

. Nieman K (7) 59

가가 가

231

95%

91%

Ropers D

16 - MDCT

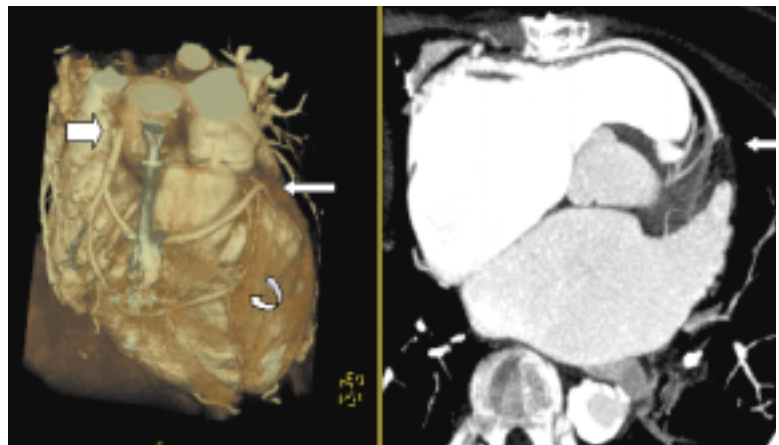
가 가 가

가 70%

80%

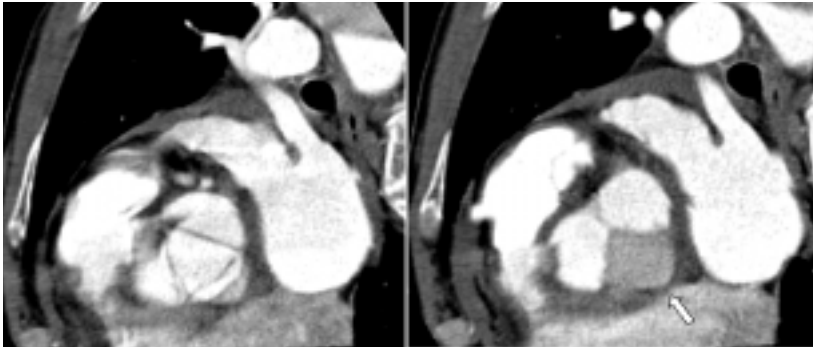
가

가 가



4.

16



5.

16

가

3) (Coronary Calcium Detection)

(Electron Beam Computed Tomography : EBCT)

가 EBCT (inter - exam variability)

(35%)

16 - MDCT

4%

(8).

가가 가

88%

MDCT

2.5 mSv

6.7 mSv

(plaque burden) 가

(9).

2.

가

16 - MDCT

16 - MDCT

(11),

가

4) 16 - MDCT

가

16 -

(12, 13)(5),

가(14, 15),

MDCT가

가,

16 - MDCT

가
가
가 가
가 60/min
atenolol
- blocker
Ropers D (6)
가 60/min
96%
60/min
가가 가
가 16 -
2.1 mSv
16 - MDCT
13.0 mSv 가
(10).

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